Building a Prototype Army Web Site for Scientific Research: Micrometerology

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Abstract

A prototype Army web site for scientific research is developed to facilitate scientific exchange necessary for efficient research productivity in the modern laboratory. The web site reported here focuses on computational and experimental field studies in micrometeorology and offers a practical format for the fast and effective communication of current research ideas with other Army Research Laboratory scientists. The new web site is located at http://w3.arl.army.mil/atunick/, although it is limited to user accounts within the ARL system.

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1. Introduction

At the U.S. Army Research Laboratory (ARL), scientists and engineers conduct research in many advanced technological areas. Researchers often work on several projects concurrently. In this highly productive work environment, the extent to which individual or groups of scientists will make time for communicating ideas about technical subjects can be limited. Creating a prototype Army web site for scientific research provides a solution: a living and revisable document to facilitate scientific exchange and effective communication of current research results. This report therefore documents the building of the prototype Army web site at http://w3.arl.army.mil/atunick/ on the ARL computer network.

Web sites benefit scientific research by providing a place for scientists to highlight specific interests or recent achievements. Web sites contain summary information about notable projects, provide access to data, or show graphs of important model results. Web sites can also provide public (or restricted password protected) access to scientific tools, program algorithms, inventory, laboratory notes, published reports, technical presentations, or abstract proposals. In particular, these features will benefit researchers who are away from their office but have access to the ARL computer network. Finally, web sites are generally low maintenance and are easily edited or revised.

Commercial software packages, such as Adobe GoLive, Lotus FastSite, and Microsoft FrontPage 98*, are available and inexpensive for the task of generating professional web pages. There are also several on-line references and guides to learning, creating, and programming in Hypertext Mark-up Language (HTML), such as the beginner's guide to HTML at http://www.ncsa.uiuc.edu/General, which is provided by the National Center for Supercomputing Applications at the University of Illinois. Navigation through web sites is usually achieved via hyperlinks; i.e., a hyperlink; is a pointer from text or from an image map to a page or other type of file on the World Wide Web (Microsoft, 1997). Hyperlinks can also be used to provide a gateway to other web sites, such as on-line technical journals, dictionaries, university departments, news, or weather information.

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*The use of commercial or company names with regard to computer products does not constitute an endorsement by the U.S. Army.

2. Building the Web Site

The prototype Army web site detailed in this report was created within Microsoft FrontPage 98 via its "Navigation View" applet that enables users to construct an "active" flowchart to select the initial number, titles, and location of pages the site will contain (see fig. 1). The applet also makes possible "drag-and-drop" adjustments of entire sections of the web site at one time. The equivalent to this task programming in HTML, i.e., to link pages together accurately and consistently, would take hours of additional work (Microsoft, 1997). The content of each page was then developed in the FrontPage 98 "Page Editor" applet, which functioned like other document editors.

In constructing the web site, it was necessary to learn HTML to add and improve features associated with embedded image files and hyperlinks. Trial and error was required to test the hyperlinks, check the visual presentation, and to ensure the fast application (opening) of image (BMP, GIF, JPG, etc...), portable document format (PDF), Power Point (PPT), and text (DOC, HTM, TXT, etc...) documents.

The web site reported here focuses on computational and experimental field studies in micrometeorology. Currently, the web site contains discussions taken from past journal articles and conference papers. Access is provided to several unclassified (i.e., approved for public release and unlimited distribution) documents and/or presentations of recently published ARL Memorandum Reports. The web site also contains interesting results from atmospheric computer models for optical turbulence and the surface energy budget (fig. 2). Additionally, as shown in figure 3, equations within the text of research papers can be imported easily to the web document, since they are treated individually as image files. Table 1 provides a summary of the documents and images that were included when this report was written.

Figure 1. The
FrontPage 98—
Navigation View
applet provides a
simple and efficient
way to outline the
structure of the web
site and assign titles to
the pages it will
contain. (The
Navigation View
applet also acts as a
gateway to the
individual web pages
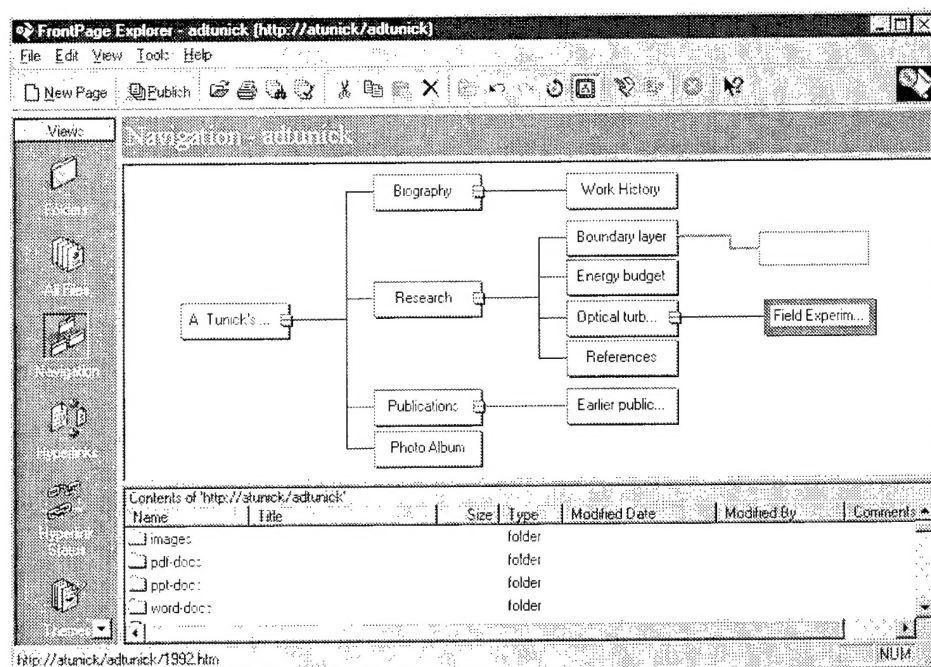and the FrontPage 98
page editor applet.)

Figure 2. The image
SFCEB.GIF (263 KB)
imported at the top of
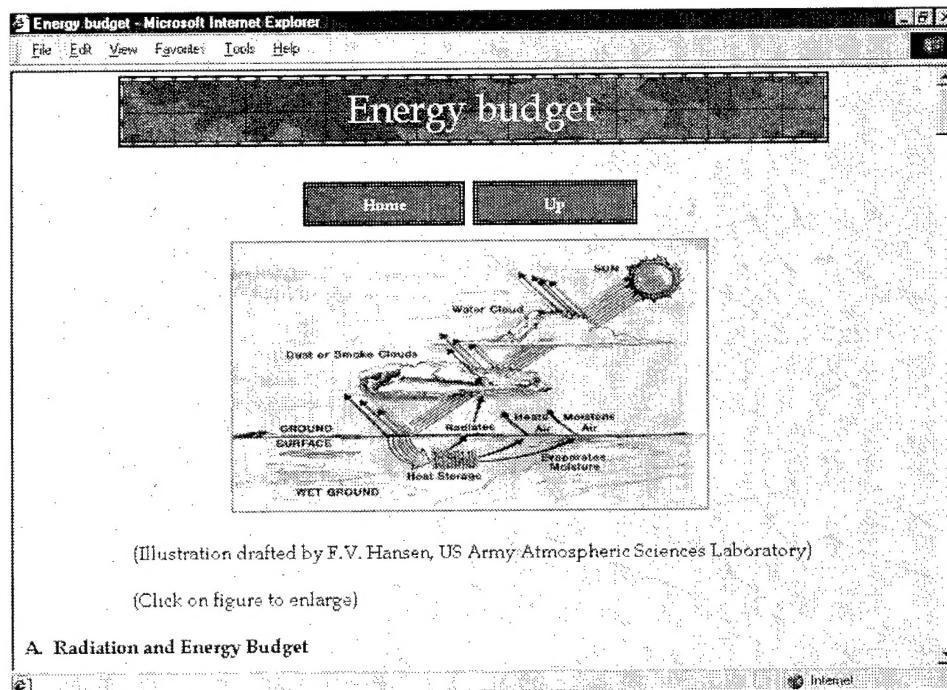the "Energy Budget"
web page.

Figure 3. An example of equations and text imported to the "Energy Budget" web page.
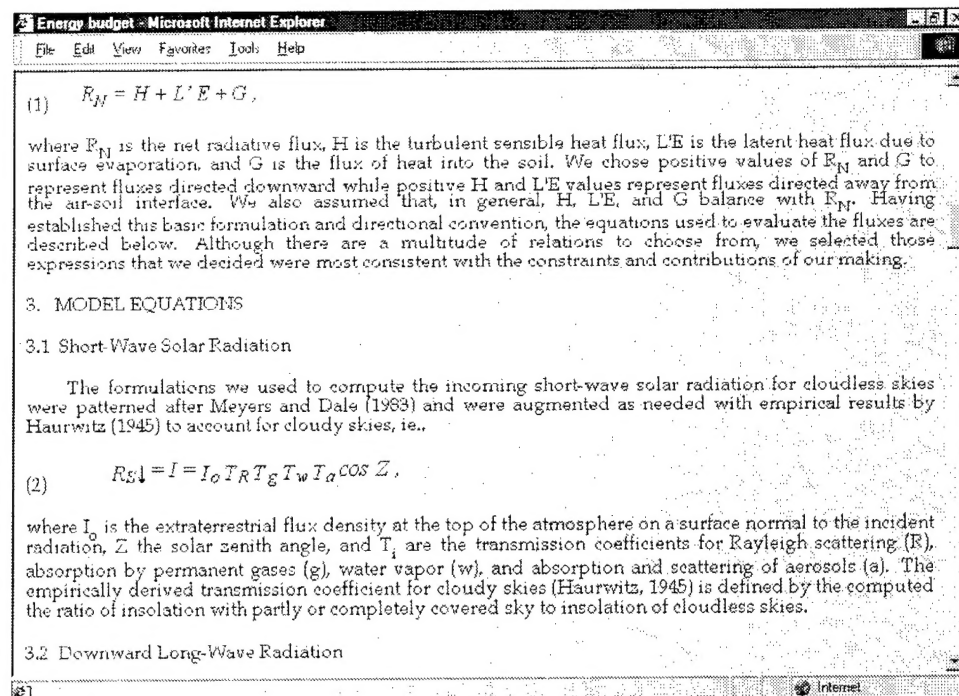
File   Edit   View   Favorites   Tools   Help

(1) $R_N = H + L'E + G,$

where R_N is the net radiative flux, H is the turbulent sensible heat flux, L'E is the latent heat flux due to surface evaporation, and G is the flux of heat into the soil. We chose positive values of R_N and G to represent fluxes directed downward while positive H and L'E values represent fluxes directed away from the air-soil interface. We also assumed that, in general, H, L'E, and G balance with R_N. Having established this basic formulation and directional convention, the equations used to evaluate the fluxes are described below. Although there are a multitude of relations to choose from, we selected those expressions that we decided were most consistent with the constraints and contributions of our making.

3. MODEL EQUATIONS

3.1 Short-Wave Solar Radiation

The formulations we used to compute the incoming short-wave solar radiation for cloudless skies were patterned after Meyers and Dale (1983) and were augmented as needed with empirical results by Haurwitz (1945) to account for cloudy skies, ie.,

(2) $R_S{\downarrow} = I = I_o T_R T_g T_w T_a \cos Z,$

where I_o is the extraterrestrial flux density at the top of the atmosphere on a surface normal to the incident radiation, Z the solar zenith angle, and T_i are the transmission coefficients for Rayleigh scattering (R), absorption by permanent gases (g), water vapor (w), and absorption and scattering of aerosols (a). The empirically derived transmission coefficient for cloudy skies (Haurwitz, 1945) is defined by the computed the ratio of insolation with partly or completely covered sky to insolation of cloudless skies.

3.2 Downward Long-Wave Radiation

Internet

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Table 1. A summary of embedded features contained in the web site.

Item description	Page location	Source
Hit counter–number of visitors	Home Page	Common gateway interface (CGI) script at http://www.mit.edu/doc/counter-howto.html
A report	Boundary Layer	ARL-MR-448.pdf (Tunick, 1999)
A report	Boundary Layer	ARL-MR-484.pdf (Tunick, 2000)
A technical poster	Boundary Layer	A one-dimensional atmospheric boundary layer model: Comparison with observations
A technical poster	Boundary Layer	A one-dimensional atmospheric boundary layer model: Intermittent wind shears and thermal stability at night
An image	Energy Budget	Illustration drafted by F.V. Hansen, U.S. Army Atmospheric Sciences Laboratory
An image	Energy Budget	Model results in comparison to observed data
A report	Optical Turbulence	ARL-TR-1615.pdf (Tunick, 1998)
An image	Optical Turbulence	Model results in comparison to observed data
An image gallery	Photo Album	1992 ARL/ARS cooperative meteorological field study
A reference index	References	Extensive literature survey on related research topics

3. Requesting Web Space and Transferring Files to the ARL Intranet

To obtain space on the ARL computer network for the new web document, an account on w3.arl.army.mil was requested. The point of contact for new accounts when this web site was constructed was the Web Host Administrator of CISD's Knowledge Management Center Branch (AMSRL-CI-OK) located at the U.S. Army Aberdeen Proving Ground. The new web site was completed after transferring web (HTML) files, image files, and document files to w3.arl.army.mil.

ARL's computer network (Unix) administrators will maintain revised security procedures and software for w3.arl.army.mil to avoid such problems as the Code Red Worm (July 31, 2001). New account files and folders can be additionally guarded from unauthorized access by applying the Unix command "chmod–R" through the directory and branches containing web (HTML) documents.

As a final note, it appears that some internet browsers allow the current web site's image and photograph files to shift out of position, overlap, and overwrite text on the page. The reason for this (possibly) is that some internet browsers do not treat loosely placed image files well. For example, image files may be repositioned on a page, depending on the size of the viewing area (S. Choy, 2001, personal communication). To circumvent this problem, it was suggested that image files be placed in tables (i.e., in cells), thereby setting their position side by side.

4. Recommendations for Future Improvement

It was commented that the early stages of a web site's development are optimal for growth. As such, the following actions were recommended:

- Contact the network administrator for the search engine on the ARL Intranet to index key words for the current web site.

- Add reports on team projects, meeting summaries, task proposals, and submitted publications.

- Post current discussion threads and links to co-workers' (and university) home pages.

- Create site maps and indices to help communicate the contents of the web site.

5. Conclusion

At ARL, the extent to which individual or groups of scientists will make time for communicating ideas about technical subjects is limited. Creating a prototype Army web site for scientific research offers a practical format for the fast and effective communication of current research ideas with other ARL scientists. The web site described in this report is a new document available only through user accounts within the ARL computer network.

Acknowledgments

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Microsoft, 1997: *Getting started with Microsoft FrontPage 98*. Microsoft Corporation, 309 pp.

Tunick, A., 2000: *A One-Dimensional Atmospheric Boundary Layer Model: Comparison with Observations*. ARL-MR-484, September, U.S. Army Research Laboratory.

Tunick, A., 1999: *A Review of Previous Works on Observing the Atmospheric Boundary Layer Through Meteorological Measurements*. ARL-MR-448, September, U.S. Army Research Laboratory.

Tunick, A., 1998: *A Refractive Index Structure Parameter Model*. ARL-TR-1615, April, U.S. Army Research Laboratory.

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